

CA-NV AWWA Water Loss Technical Assistance Program Wave 4 Water Audit Level 1 Validation Document

Audit Information:

Utility: Palo Alto PWS ID: 4310009
System Type: Potable Audit Period: Calendar 2016
Utility Representation: Jennifer Cioffi, Kevin Carley
Validation Call Date: 8/24/2017 Call Time: 12:00 pm Sufficient Supporting Documents Provided: Yes

Validation Findings & Confirmation Statement:

Key Audit Metrics:

Data Validity Score: 51 Data Validity Band (Level): Band III (51-70)
ILI: 1.15 Real Loss: 15.83 (gal/conn/day) Apparent Loss: 4.53 (gal/conn/day)
Non-revenue water as percent of cost of operating system: 3.5%

Certification Statement by Validator:

This water loss audit report has been Level 1 validated per the requirements of California Code of Regulations Title 23, Division 2, Chapter 7 and the California Water Code Section 10608.34.

All recommendations on volume derivation and Data Validity Grades were incorporated into the water audit. ☒

Validator Information:

Water Audit Validator: Tory Wagoner Validator Qualifications: Contractor for CA-NV AWWA Water Loss TAP

Validator Provided

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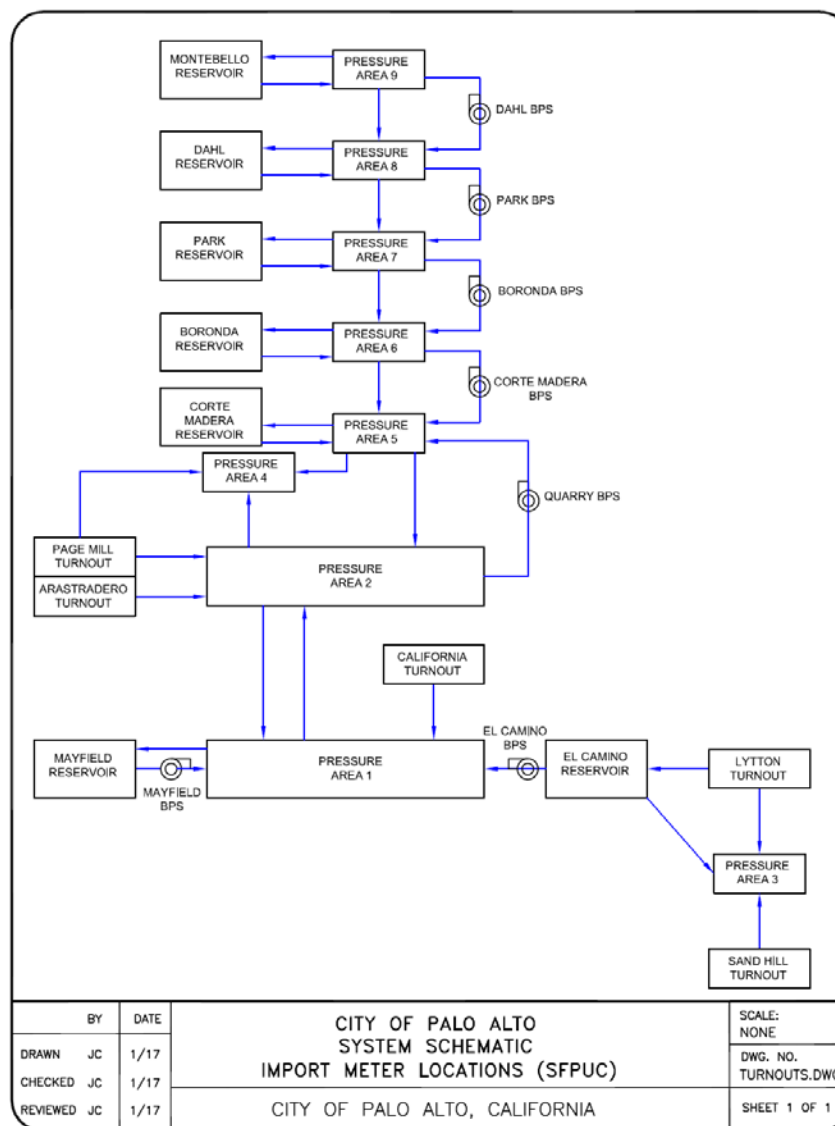
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#	AWWA Water Audit Input	Code	Final DVG	Basis on Input Derivation	Basis on Data Validity Grade
1	Volume from Own Sources	VOS	n/a	Supply meter profile: Import supply only with emergency well as needed.	
2	VOS Master Meter & Supply Error Adjustment	VOS MMSEA	n/a		
3	Water Imported	WI	3	<p>Import meter profile: Supply imported from SFPUC through five turnouts.</p> <p>WI input derived from: Totalization of volumes per invoices received from exporter.</p> <p>Comments: Input derivation from supporting documents confirmed. Exclusion of non-potable volumes confirmed.</p>	<p>Percent of import supply metered: 100%</p> <p>Signal calibration frequency: Within last 5 years but less than annually.</p> <p>Volumetric testing frequency: None.</p> <p>Volumetric testing method: n/a.</p> <p>Percent of import supply volumetrically tested: n/a.</p> <p>Comments: No additional comments.</p>
4	WI Master Meter & Supply Error Adjustment	WI MMSEA	5	<p>Input derivation: Left blank in absence of available test data.</p> <p>Comments: No additional comments.</p>	<p>Import meter read frequency: Continuous.</p> <p>Import meter read method: Manual and automatic logging.</p> <p>Frequency of data review for trends & anomalies: Monthly.</p> <p>Comments: No additional comments.</p>
5	Water Exported	WE	n/a	Export meter profile: Several connections for emergency purposes only	
6	WE Master Meter & Supply Error Adjustment	WE MMSEA	n/a		
7	Billed metered	BMAC	5	<p>Customer meter profile:</p> <p>Age profile: Some as old as 20 years old, but varying</p> <p>Reading system: Manual with pilots on other technologies.</p> <p>Read frequency: Monthly.</p> <p>Comments: Lag-time correction is not employed in input derivation. Input derivation from supporting documents confirmed. Exclusion of non-potable volumes confirmed.</p>	<p>Percent of customers metered: 100%</p> <p>Small meter testing policy: Reactive - complaint based or flagged-consumption testing only.</p> <p>Number of small meters tested/year: Not quantified, but known to be small.</p> <p>Large meter testing policy: Reactive - complaint based or flagged-consumption testing only.</p> <p>Number of large meters tested/year: Not quantified, but known to be small.</p> <p>Meter replacement policy: During capital projects</p>

#	AWWA Water Audit Input	Code	Final DVG	Basis on Input Derivation	Basis on Data Validity Grade
					<p>Number of replacements/year: 150-200</p> <p>Billing data auditing: Standard billing QC, plus review of volumes by use type each billing cycle.</p> <p>Comments: No additional comments.</p>
8	Billed unmetered	BUAC	n/a		
9	Unbilled metered	UMAC	n/a	Profile: Own facilities flow through billing process	
10	Unbilled unmetered	UUAC	5	<p>Profile: Operational flushing and fire department usage.</p> <p>Comments: Flushing activities greatly scaled back due to drought. Custom California default of 0.25%xWS utilized.</p>	Comments: Default grade applied.
11	Unauthorized consumption	UC	5	Comments: Default input applied.	Comments: Default grade applied.
12	Customer metering inaccuracies	CMI	3	<p>See BMAC comments regarding meter testing & replacement activities.</p> <p>Input derivation: Inferred from reference data (manufacturer, anecdotal test results) but not derived from test data analysis & calculation.</p> <p>Comments: No additional comments.</p>	<p>Characterization of meter testing: Limited (upon request AND consumption flag only).</p> <p>Characterization of meter replacement: Routine (proactive), but limited.</p> <p>Comments: No additional comments.</p>
13	Systematic data handling errors	SDHE	5	Comments: Default input applied.	Comments: Default grade applied.
14	Length of mains	Lm	9	<p>Input derivation: Totaled from GIS based map.</p> <p>Hydrant leads included: Not included. Recommend including in input derivation for next audit.</p> <p>Comments: No additional comments.</p>	<p>Mapping format: Digital.</p> <p>Asset management database: In place and integrated with GIS system.</p> <p>Map updates & field validation: Accomplished through normal work order processes.</p> <p>Comments: No additional comments.</p>
15	Number of service connections	Ns	8	<p>Input derivation: Standard report run from GIS.</p> <p>Basis for database query: Location or other premise-based ID.</p> <p>Comments: No additional comments.</p>	<p>CIS updates & field validation: Accomplished through normal meter reading processes.</p> <p>Estimated error of total count within: 2%.</p> <p>Comments: No additional comments.</p>

#	AWWA Water Audit Input	Code	Final DVG	Basis on Input Derivation	Basis on Data Validity Grade
16	Ave length of cust. service line	Lp	10	Comments: Default input and grade applied, as customer meters are typically located at the property boundary given California climate.	
17	Average operating pressure	AOP	4	Number of zones, general profile: Nine operating zones Typical pressure range: 30 – 100+ psi Input derivation: Calculated as simple average from analysis of field data. Comments: No additional comments.	Extent of static pressure data collection: Hydrant pressures taken during routine system flushing and/or hydrant testing. Characterization of real-time pressure data collection: Basic - telemetry or pressure logging at boundary points (supply locations, tanks, PRVs, boosters). Hydraulic model: In place and calibrated within the last 5 years. Comments: No additional comments.
18	Total annual operating cost	TAOC	10	Input derivation: From official financial reports. Comments: Confirmed costs limited to water only, and water debt service included.	Frequency of internal auditing: Annually. Frequency of third-party CPA auditing: Annually. Comments: No additional comments.
19	Customer retail unit cost	CRUC	9	Input derivation: Total consumptive revenue divided by Billed Metered Authorized Consumption. Sewer charges are based on water meter readings. Sewer revenues are incorporated into calculation. Comments: No additional comments.	Characterization of calculation: Weighted average composite of all rates. Input calculations have not been reviewed by an M36 water loss expert. Comments: No additional comments.
20	Variable production cost	VPC	5	Supply profile: Import supply only. Primary costs included: Purchase costs and supply & distribution power. Secondary costs included: None currently included. Comments: No additional comments.	Characterization of calculation: Primary costs only. Input calculations have not been reviewed by an M36 water loss expert. Comments: No additional comments.

Key Audit Metrics

(~)	VALIDITY	Data Validity Score: 51	Data Validity Band (Level): Band III (51-70)
(#)	VOLUME	ILI: 1.15	Real Loss: 15.83 (gal/conn/day) Apparent Loss: 4.53 (gal/conn/day)
(\$)	VALUE	Annual Cost of Apparent Losses: \$561,713	Annual Cost of Real Losses: \$879,700

Infrastructure & Water Loss Management Practices:

Infrastructure age profile: Varying Infrastructure replacement policy (current, historic): Replacing about 3 miles/year
 Estimated main failures/year: <100 Estimated service failures/year: More than mains
 Extent of proactive leakage management: Pilot with large main assessment and leak detection, have correlator but unhappy with results.
 Other water loss management comments: No additional comments.

Comments on Audit Metrics & Validity Improvements

The Infrastructure Leakage Index (ILI) of 1.15 describes a system that experiences leakage at 1.15 times the modeled technical minimum for its system characteristics.

The Data Validity Score falling within Band III (51-70) suggests that next steps may be focused simultaneously on improving data reliability and evaluating cost-effective interventions for water & revenue loss recovery. Opportunities to improve the reliability of audit inputs and outputs include:

- Improved understanding of Supply Meter (Own or Import) Master Meter Error: consider adopting or increasing the rigor of a source meter volumetric testing and calibration program, informed by the guidance provided in AWWA Manual M36 – Appendix A.
- Temporal alignment of Billed Metered Authorized Consumption with Water Supplied: consider pro-rating the first and last months of the audit period to better align consumption with actual dates of use, and using read date as basis for reporting.
- Level 2 validation on raw data for Billed Metered Authorized Consumption to determine and resolve any instances of potable volume duplication or non-potable volume inclusion.
- Customized estimate of Unbilled Unmetered Authorized Consumption: consider producing itemized, agency-specific estimates of unbilled unmetered (operational) uses, rather than using the default. Ensure leakage estimates are excluded.
- Improved estimation of CMI: consider a customer meter testing program which tests a sample of random meters whose stratification (by size, age, or other characteristics) represents the entire customer meter stock.

When the CA-NV AWWA Water Audit Validator (WAV) program comes online after this year, is the utility planning on having a staff member become certified to perform the Level 1 Validation for future audits? Yes.

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Water System Name: City of Palo Alto

Water System ID Number: 4310009

Water Audit Period: Calendar 2016

Water Audit & Water Loss Improvement Steps:

Steps taken in preceding year to increase data validity, reduce real loss and apparent loss as informed by the annual validated water audit:

Since learning of the required yearly water loss reporting, the City has taken preliminary steps to increase data validity, and reduce real and apparent losses. In order to increase our overall Data Validity Score for 2017 reporting, the City will be implementing a new water meter testing, calibration and replacement plan, and will be tracking how much water is used during flushing, fire-fighting and repair activities.

Certification Statement by Utility Executive:

This water loss audit report meets the requirements of California Code of Regulations Title 23, Division 2, Chapter 7 and the California Water Code Section 10608.34 and has been prepared in accordance with the method adopted by the American Water Works Association, as contained in their manual, *Water Audits and Loss Control Programs, Manual M36, Fourth Edition* and in the Free Water Audit Software version 5.

Utility Provided

Dean Batchelor

Executive Name (Print)

Utility Chief Operating Officer

Executive Position

Dean Batchelor

Signature

9/29/17

Date